January 12, 1837.

CAPTAIN SMYTH, R.N., Vice-President, in the Chair.

"An attempt to account for the discrepancy between the actual Velocity of Sound in Air or Vapour, and that resulting from theory." By the Rev. William Ritchie, LL.D., F.R.S. Professor of Natural Philosophy at the Royal Institution, and in University College, London.

Sir Isaac Newton determined from theory that the velocity of the undulations of an elastic medium generally is equal to that which a heavy body acquires in falling by the action of gravity through half the height of a homogeneous atmosphere of that medium; but the actual velocity of sound in atmospheric air is found to be one eighth greater than what is assigned by that formula. This difference was attempted to be accounted for by Newton on the supposition that the molecules of air are solid spheres, and that sound is transmitted through them *instanter*. Laplace endeavoured to reconcile the difference between theory and observation, by the hypothesis that heat is disengaged from each successive portion of air during the progress of the condensed wave. The author of the present paper regards the hypothesis of Laplace as a gratuitous and improbable assumption; the falsehood of which he thinks is apparent from the fact that a rarefied wave advances through air with the same velocity as a condensed wave, which would not be the case if in either instance their progress were influenced by the heat evolved. He then enters into calculations to show that if the molecules of water be assumed as incompressible, and, when at the temperature of maximum density, very nearly in absolute contact, we ought, in estimating the velocity of sound in steam, to add to the velocity given by the formula of Newton, the rectilinear space occupied by the molecules; which, if a cubic inch of water be converted into a cubic foot of steam, will be one twelfth of the distance. By comparative experiments with a tuning-fork held over a tube, closed at one end, and containing at one time air, and at another steam, and also by similar trials with organ pipes of variable lengths, the author found a close agreement between his theory and observation. He also shows that this theory furnishes the means of determining, *à priori*, the density of a liquid, if the velocity of sound in the vapour of that liquid be given. In a postscript he adduces further confirmation of the truth of his theory by observations on the velocity of sound in hydrogen gas, and in carbonic acid gas.

January 19, 1837.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair.

Benjamin Bond Cabbell, Esq., Charles Holland, M.D., John Urpath Rastrick, Esq., and Samuel Solly, Esq., were elected Fellows.